

CHAPTER 6 - SOUTH LAKE UNION SUBBASIN OPERATION IMPACTS

The impacts associated with operation of the Denny/Lake Union Project are primarily the benefit to water quality. Reduction of CSO flow volumes to one untreated discharge per outfall per year would greatly reduce CSO-related pollutant discharges to Lake Union compared to the existing overflow of over 100 MG of untreated sewage from Seattle outfalls on the eastern and southern portions of the lake and King County's Dexter overflow on the western shore of Lake Union.

This chapter describes the impacts in the South Lake Union Subbasin from operation of Phases 2 and 3/4 for both the Preferred Alternative and Alternative 2. Cumulative impacts are discussed in Chapter 9. Mitigation measures to mitigate adverse impacts are provided in Chapter 10.

For some elements of the environment, the No Action Alternative would produce no operation impacts. Under the No Action Alternative, King County and Seattle would continue to discharge untreated combined sewage out the existing outfalls and the improved water quality benefits of control would not be obtained. The elements affected by a decrease in water quality are water, biological and environmental health.

6.1 EARTH RESOURCES

No impacts to earth resources would occur during operation of the South Lake Union Subbasin facilities under Alternative 1. Some contaminated sediments may be discharged from the stormwater outfalls into Lake Union under Alternative 2.

6.2 AIR RESOURCES

6.2.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

Outfalls

Under Alternative 1, the existing outfall to South Lake Union would be eliminated. No odor complaints have been reported from this outfall, and no new odor-related impacts would occur.

Conveyance

No significant odor-related impacts are anticipated. Odors could occur during overflow events where manholes vent conveyance pipelines. However, overflows would typically remain in conveyance facilities for 48 hours or less, and overflows would most frequently occur during cooler months of the year when odor production is lower. Newly constructed conveyance facilities would transport a mixture of stormwater and sewage during overflow events, reducing the potential for odor generation compared to combined sewer conveyance facilities. With proper design and long-term maintenance of pipelines, operation of conveyance facilities is not expected to present significant odor problems.

Regulating Structures

Odor generation during overflow events at the Central Trunk Diversion Structure and the Lake Union Tunnel Regulator Station would be unlikely. Turbulent conditions could generate odors by increasing the release of hydrogen sulfide and other odor-causing gases. Under such conditions odor can be generated in regulating facilities similar to those conditions associated with conveyance facilities. Surrounding land uses include commercial shops and restaurants with high levels of pedestrian use during daytime hours, therefore, any odors generated would likely be noticed. Because CSO events occur intermittently and these facilities would be contained in an airtight sealed structure, no significant odor-related impacts are anticipated. Refer to the discussion of odor-related impacts under Conveyance above.

CSO Control

Odors could be generated where overflow between pipelines occurs at the East Tunnel Portal Drop Structure. A point of free fall and turbulent conditions at the drop structure could generate odors by increasing the release of hydrogen sulfide or other odor-causing gases. Odor problems would be intermittent, occurring during cooler months and consisting of a mixture of sanitary sewage and stormwater, reducing the potential for objectionable odors. A passive activated carbon system has been proposed for the east portal of the Mercer Street Tunnel. This system would be designed with adequate space to allow a fan to be installed in the future. With proper design and maintenance, no significant odor problems are anticipated.

6.2.2 Alternative 2 - Partial Separation and Storage

Outfalls

No significant odor-related impacts would occur under this alternative. The existing outfall to south Lake Union would be capped, and a new South Lake Union Overflow would discharge stormwater to Lake Union. No CSO-related odor complaints have been reported in the subbasin, and no significant odors have been associated with stormwater discharges.

Conveyance

Impacts from conveyance facilities would be similar to those described for Alternative 1. This alternative involves constructing an extensive network of separate stormwater pipelines. Odor generation would be greatest in the existing pipelines, which would convey only sanitary sewage. Flows would consist of more concentrated sewage of higher temperature compared to CSO flows, resulting in a higher odor generation potential than under Alternative 1.

Regulating Structures

With proper design and regular inspection of the Dexter Avenue Diversion Structure, operation of regulating structures is not expected to present significant odor problems. No odor control equipment installation is currently planned for the diversion structure proposed under Alternative 2 as this would be an airtight, sealed structure.

CSO Control

Periods of objectionable odors could occur at the South Lake Union CSO Control Facility during overflow events where manholes vent the storage facility. Stagnant conditions could increase the likelihood for hydrogen sulfide gas to be vented to street level, and low levels of odors could be noticeable to commercial businesses for short periods of time. However, overflows would typically remain in the storage tanks for 48 hours or less, and would typically occur during cooler, wetter months when odor production potential is low. Overflows would remain in the storage tanks for longer than Alternative 1 due to higher volume of stored flows. Most of the conditions that result in odor generation (oxygen-depleted sewage, warm temperature, and slow moving conditions) are not present during CSO events. With proper design and regular inspection of facilities, operation is not expected to present significant odor problems.

6.2.3 Alternative 3 - No Action

Existing sources of odor in the South Lake Union Subbasin would remain the same. Odors associated with CSO discharges would remain the same as current conditions, or would increase as volumes and/or frequencies of CSOs increase in the future. No new potential sources of odor would be introduced as part of this alternative.

6.3 WATER RESOURCES

Because the area is almost entirely developed, future wastewater flows and stormwater generated by impervious surfaces are not expected to increase noticeably from current levels. Therefore, no impacts from increased future flows are expected to occur.

6.3.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

Outfalls and CSO Control

Water Resources impacts from outfalls relate to the operation of CSO control facilities.

Surface Water. Eliminating CSO #125 to Lake Union will result in a significant water quality improvement. Approximately 3.2 MG currently discharges to south Lake Union annually from CSO #125. CSO flows at this location, which is adjacent to a children's playground, would be eliminated. CSO discharges vary from event to event, but frequently contain high levels of bacteria, biochemical oxygen demand (BOD), suspended solids, metals, as well as toxic organic constituents. Many of these constituents, including metals and organic constituents such as PAHs, are attached to particulates which settle out in the vicinity of the CSO outfall. These constituents

remain in the sediments and can be slowly released to the water column and/or can affect benthic organisms in the vicinity of the outfall. By eliminating CSO discharges at CSO #125, a significant source of pollutant loading to both the water column and adjacent sediments would be eliminated. Sediment quality in the vicinity of CSO #125, as well as nearly all of south Lake Union, was identified as a potential threat to organisms living in or coming in contact with the sediments (Metro 1995). Loading from CSO #125 would no longer contribute to chronic sediment deposition in Lake Union, which would help to improve water quality over the long term. CSOs typically include contaminants which exert a significant oxygen demand; these constituents, when deposited in sediments adjacent to the CSO outfall, continue to exert an oxygen demand long after the overflow has stopped. Eliminating these discharges would help to reduce oxygen demand in the oxygen-depleted South Lake Union area.

Groundwater. Operation impacts on groundwater associated with all project facilities would be minimal. There is a minor risk that pipelines or other project facilities may break or leak exposing adjacent groundwater to a dilute concentration of untreated wastewater and stormwater. However, such leaks are rare, as pipelines would be designed to withstand stresses, corrosion, and potential rupture from earthquakes, loads from the surface, and soil instability.

Conveyance

Surface Water. The conveyance network included under Alternative 1 is designed to significantly reduce discharge of untreated CSOs to Lake Union with accompanying water quality benefits. Annual CSO flows to Lake Union would be reduced by approximately 100 MG annually. In addition, the number of CSO events would be reduced from up to 115 events per year to less than one per year at each outfall. CSOs would occur during only significant rain events, at a frequency of approximately once per year at CSO #175. By reducing the volume of untreated CSOs discharging to Lake Union, the contribution of potentially contaminated sediments in the vicinity of CSO #175 would also be reduced. As described above under Outfalls, sediments in south Lake Union have been determined to have higher than desirable levels of contaminants for aquatic and human health (Metro 1995). Therefore, any reduction in untreated CSO discharges will lessen the amount of sediment deposition, and contribute to improved water quality over the long term.

Groundwater. Operation impacts are the same as those described for outfalls.

Regulating Structures

Surface Water. Implementation of the Central Trunk Diversion Structure and the Lake Union Tunnel Regulator Station would result in overall water quality improvement. Under this alternative, discharges from the Dexter CSO would be reduced to less than one event per year, a significant reduction over the existing discharge. Water quality improvements as described above for outfalls would be achieved. This reduction, combined with the elimination of CSO #125, would significantly reduce CSO-related loading to Lake Union.

Groundwater. Operation impacts are the same as those described for outfalls.

6.3.2 Alternative 2 - Partial Separation and Storage

Outfalls

Surface Water. Impacts are the same as described for Alternative 1 relative to elimination of CSO #125. Construction of the South Lake Union Overflow would result in additional stormwater discharges to Lake Union. Stormwater flows would discharge to the south end of Lake Union near Westlake Avenue. Stormwater discharge would occur consistent with existing City requirements, including applicable requirements for stormwater quality and quantity. Although the sanitary sewage component of the CSOs would be reduced to one event per year, the contribution from stormwater would continue to discharge to Lake Union every rainfall. Because the tributary drainage area is urbanized with high volumes of traffic, stormwater discharges would likely contain elevated levels of metals and petroleum products. Even with pretreatment, some level of chronic pollutant loading to south Lake Union would continue to occur. The reduction of pollutant loading in south Lake Union from Alternative 2 would be less than achieved under Alternative 1.

Groundwater. Groundwater impacts would be similar to those discussed under Alternative 1.

Conveyance

Surface Water. Stormwater would be separated from sanitary sewage; the sanitary sewage component would be conveyed to the EBI for treatment at West Point, and stormwater would be discharged to Lake Union. Reducing the sanitary sewage component to one event per year would significantly reduce public health risks associated with bacterial and viral contamination in the CSOs, as well as reducing the BOD and suspended solids loading. However, stormwater from high vehicular traffic areas such as the South Lake Union Subbasin typically contains relatively high levels of metals such as lead, copper, and zinc, as well as petroleum products. These constituents are difficult to significantly reduce through removal or treatment methods using available best management practices (BMPs) and technologies for stormwater. An evaluation conducted in the Lake Union area (Brown and Caldwell 1993) indicated limited effectiveness for many of the currently available technologies to reduce stormwater contaminant loading. Therefore, even with implementation of BMPs, it is likely that stormwater would continue to contribute to pollutant loading in the water column and sediments of south Lake Union under Alternative 2.

Groundwater. Operation impacts would be the same as described for outfalls.

Regulating Structures

Surface Water. Long-term water quality impacts under Alternative 2 would be the same as those described for Alternative 1.

Groundwater. Operation impacts are the same as those described for outfalls.

CSO Control

Surface Water. By storing CSO flows and thereby reducing the volume and frequency of CSOs to Lake Union, the South Lake Union CSO Control Facility would contribute to long-term water quality improvement in Lake Union.

Groundwater. Operation impacts are the same as those described for outfalls.

6.3.3 Alternative 3 - No Action

Under the No Action Alternative, CSO events would be expected to continue at current volumes and frequencies. Currently, up to 115 overflow events occur in Lake Union every year, including approximately 30 events totaling 3.2 MG at CSO #125. Loadings of bacteria, metals, solids, and organics would continue increasing identified levels of contaminants in south Lake Union sediments and continue to degrade habitat for aquatic organisms.

6.4 BIOLOGICAL RESOURCES

6.4.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

Biological Resources impacts from Alternative 1 outfalls, conveyance and regulating structures are related to the operation of CSO control facilities and wastewater system. Beneficial impacts from reduction in overflows to south Lake Union resulting from operation of the CSO control portion of this project are extensive.

CSO Control

Plants, Wildlife and Habitat. No adverse impacts to plants and animals are anticipated during operation of outfalls under Alternative 1. The elimination of CSOs from CSO #125 at the children's park into Lake Union would beneficially affect aquatic plants and animals, both in the local area of the CSO #125 outfall pipe and within the lake. Under Alternative 1, total CSOs into Lake Union would be reduced, thereby improving habitat condition in the lake. Introduction of nutrients into the lake encourages growth of nuisance aquatic macrophytes such as coontail and Eurasian water milfoil. Water milfoil is considered a noxious weed in the State of Washington and is known to adversely impact fish habitat within the lake environment (EVS Consultants 1995). Reduction in overflow volumes and frequency may contribute to improved overall lake habitat for aquatic plants, especially native plants, by reducing nutrient inputs to the lake. Elimination of overflows from CSO #125 and reductions in overflows at CSO #175 and the Dexter CSO to one event per year would also contribute to improved water quality conditions and, consequently, foraging habitat for wildlife and waterfowl dependent upon fresh waterbodies. Use of Lake Union by waterfowl, raptors, shorebirds, and other water-dependent birds and mammals (e.g., muskrat, otter,) would likely increase as water quality improves. Improved water quality of inputs into Lake Union may also contribute to increased productivity in food sources (e.g., crustaceans, invertebrates, aquatic plants) for water-dependent animals.

Fisheries. Under Alternative 1, impacts on fishery resources in Lake Union would be positive. After construction, benthic communities would recolonize disturbed areas, with an accompanying re-establishment of fish in these areas. An existing outfall to Lake Union would be eliminated and

CSOs diverted to the new Mercer Street Tunnel and Elliott West CSO Control Facility for storage and treatment. The proposed project would reduce total CSOs from all Lake Union outfalls associated with the project. Sediments potentially pose a threat to species that spend much of their life histories in Lake Union or those that use benthic habitats during sensitive life stages. Significantly reducing the discharge of untreated CSOs to Lake Union would reduce the discharge of potentially toxic substances with accompanying lower levels of potentially toxic sediment deposition.

Overall, the project would benefit Lake Union fisheries resources by reducing overall volumes of untreated CSOs discharging to the lake. CSOs would be conveyed to the Elliott West CSO Control Facility, reducing discharge of bacteria, ammonia, suspended solids, metals, floatables, and other material to the lake during storm events. Fish would benefit from increased levels of dissolved oxygen, a reduced probability of ingestion or entanglement in floatables, reduced turbidity, and a reduced exposure to pathogens and contaminants. Impacts to fish from reductions in pollutant loading would be particularly beneficial in areas of low circulation in south Lake Union. Implementation of Alternative 1 could result in beneficial impacts to the lake's recreational and/or tribal fishery. Overall, the project would reduce CSOs into the lake and would improve water quality. This improvement could result in a long-term benefit for recreational and tribal fisheries.

Shellfish. The reduction of untreated overflows into Lake Union would provide increased protection to shellfish and their habitat. Under current conditions, benthic communities in sediments located near outfalls in Lake Union have been characterized as having reduced diversity and abundance (Brown and Caldwell 1994). Elevated levels of lead in crayfish have been attributed to elevated concentrations of lead in sediments (Cubbage 1992; Brown and Caldwell 1994). Studies of metals concentrations in Lake Union sediments over the past ten years indicate that in general, sediments are "heavily polluted and likely to affect the health of benthic species," with the highest concentrations occurring in the southern and southeastern portions of the lake (Brown and Caldwell 1994). Conveyance projects transferring flow volumes would contribute to reducing pollutant loads to sediments, including metals and total suspended solids. Over a period of time, this would improve sediment quality and potentially increase the diversity and abundance of benthic organisms in the areas impacted by CSOs. In addition, crayfish and other benthic organisms, as prey species for fish, would be less likely to transfer contaminants.

6.4.2 Alternative 2 - Partial Separation and Storage

Biological Resources impacts from Alternative 2 outfalls, conveyance and regulating structures are related to the operation of CSO control facilities and wastewater system. Beneficial impacts from reduction in overflows to South Lake Union resulting from operation of the CSO control portion of this project are extensive.

Plants, Wildlife and Habitat. Similar to Alternative 1, the elimination of CSOs from CSO #125 at the children's park may beneficially affect aquatic vegetation and waterfowl habitat. Under Alternative 2, CSOs would be reduced in Lake Union. Similar to Alternative 1, reduction in overflow volumes would reduce nutrients of the lake which may contribute to improved overall lake habitat for aquatic plants. Similar to Alternative 1, elimination of overflows from CSO #125 and reduction in overflows from CSO #175 and the Dexter CSO would contribute to improved

water quality conditions and, consequently, foraging habitat for wildlife and waterfowl dependent upon freshwater habitat in Lake Union. Use of Lake Union by waterfowl, shorebirds, and other water-dependent birds and mammals may be encouraged as water quality improves. The new South Lake Union Overflow, as proposed under Alternative 2, would convey stormwater to Lake Union during frequent storm events and CSOs from the South Lake Union CSO Control Facility. This new outfall is only an emergency overflow for CSOs. Stormwater which was previously directed to the sewer system would now be released directly into Lake Union through the South Lake Union Overflow. Stormwater would be discharged in accordance with state water quality and sediment management standards. Therefore, stormwater entering the lake would not likely adversely affect waterfowl or habitat used by water-dependent animals or plants.

During years of average rainfall, CSOs would occur at the Dexter CSO and CSO #175 at a maximum frequency of once per year; although CSOs may occur at a greater frequency during years of above-average rainfall. Although occurring infrequently, CSOs may adversely affect the water quality and local aquatic habitat currently available in the southwestern corner of the lake near South Lake Union Park. This area of the lake provides shallow water (littoral) habitat for waterfowl, such as dabbling and diving ducks, and fish habitat (see Shellfish and Fisheries sections below for details regarding fish impacts). However, overall CSO inputs to Lake Union would be reduced under the implementation of Alternative 2, thereby contributing to the overall improvement in water quality and habitat quality within the lake.

Fisheries. Overall impacts to fish habitat and fish species in the lake would be positive under operation of Alternative 2. Refer to Alternative 1 for a complete discussion of overall project benefits from project operation. Under Alternative 2, an increase in turbidity and delivery of sediments, metals, and organic pollutants associated with stormwater would occur locally in the vicinity of the discharge points. Total flow volume of stormwater to Lake Union under Alternative 2 is estimated at 43 MG annually. Stormwater overflows would occur at a frequency of every rainfall. Stormwater would be discharged in accordance with state water quality and sediment management standards, which would reduce sediments containing concentrations of particulate-associated constituents, including metals, from entering the lake. This would reduce sediment loading to Lake Union in the vicinity of the outfall and minimize the impacts of CSO discharges on water quality and fish habitat. Depending on the site selected for the outfall, disturbance of lake bottom sediments in the vicinity of identified littoral habitat near South Lake Union Park could occur during discharge events.

Shellfish. Operational impacts to shellfish from the reduction of CSOs into the lake are the same as for Alternative 1. Separation of stormwater under Alternative 2 would result in some deposition of sediments containing metals and bacteria, a portion of which would settle around the outfall and affect shellfish species in the area. However, as described above for Fisheries, impacts to shellfish habitat and species from the South Lake Union Overflow would be minimized through compliance with state water quality and sediment management standards. In comparison to existing conditions, impacts to shellfish would be positive from the overall reduction in pollutant loading to sediments.

6.4.3 Alternative 3 - No Action

CSO discharges to Lake Union would continue under this alternative, resulting in ongoing pollutant loadings at levels equal to or greater than current conditions. Solids deposition to sediments would continue in the vicinity of existing CSO outfalls, with accompanying potential impacts to the aquatic community. Contaminants of concern, including toxic metals and toxic organic constituents, would continue to be discharged to Lake Union. As a result of continued or increased discharge of contaminants in CSOs, aquatic diversity may decline in the vicinity of active CSO outfalls.

6.5 ENERGY

Intermittent operation of the regulating and control structures under Alternatives 1 and 2 would involve long-term consumption of electrical energy and maintenance vehicles would use fossil fuels. Usage of electricity from the new facilities under both Alternatives 1 and 2 for the South Lake Union Subbasin would be minimal in comparison to electricity used in the Elliott Bay Subbasin. Alternative 3 would not have any new facilities and would therefore not use any additional energy resources.

6.6 ENVIRONMENTAL HEALTH

6.6.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

Outfalls

Under Alternative 1, overflows would discharge at the Dexter CSO and east Lake Union outfalls once per year or less, thereby reducing the discharge of approximately 100 gallons of CSOs per year into south Lake Union. No adverse impacts would occur, and outfall removal would eliminate any existing environmental health risk associated with the outfall. This outfall is located in the vicinity of a small neighborhood park where water contact may occur. The potential for public health impacts associated with water contact would be eliminated at this location and reduced at other locations throughout Lake Union.

Conveyance and Regulating Structures

No long-term impacts to environmental health due to operation of pipelines or regulating facilities are anticipated. There is a minor risk that pipelines may break, exposing adjacent areas to a dilute concentration of untreated wastewater and stormwater. However, such breaks are considered rare, as pipelines are designed to withstand stresses, corrosion, potential rupture from earthquakes, loads from the surface, and soil instability. Although facilities placed in areas of wood waste fill could result in the buildup of methane gas, these facilities would be designed to prevent explosive buildup of methane.

CSO Control

Overall, the proposed project would reduce overflows at the King County's Dexter CSO and the City of Seattle overflows to east and south Lake Union to one CSO event per outfall per year, greatly reducing potential environmental health impacts due to contact with untreated sewage in the South Lake Union Subbasin. Because overflows typically occur during rainy periods and a significant storm would be required to cause an overflow following improvements, there would be a relatively low likelihood for

individuals to come in contact with CSO flows in south Lake Union. Benefits would include a substantially lower potential for direct human contact with fecal coliform bacteria, viruses, petroleum products, and metals associated with CSOs.

6.6.2 Alternative 2 - Partial Separation and Storage

Outfalls

Under Alternative 2, an existing CSO outfall to Lake Union would be eliminated and an additional stormwater outfall would be constructed. While the outfall also would be designed to serve as an emergency overflow from the storage facility, CSOs at this outfall would only occur during severe storm events less than once per year. In general, impacts to environmental health would be positive, as described for Alternative 1.

Conveyance and Regulating Structures

Impacts are similar to those described for Alternative 1.

CSO Control

Potential environmental health impacts from the South Lake Union CSO Control Facility are similar to those associated with conveyance and regulating structures discussed under Alternative 1. The storage facility would be covered, with public access prohibited to minimize the potential for accidental human contact with CSOs. Stormwater discharges could impact environmental health by exposing humans and aquatic organisms to metals and petroleum products. These impacts would be slightly greater than those associated with Alternative 1 due to the increased volumes and frequency of stormwater discharge to the lake (Brown and Caldwell 1994). The greatest likelihood of contact with discharged materials would be through the sediments deposited near the outfall. Although the stormwater would be discharged in compliance with city requirements, particulates would continue to be discharged to the lake.

6.6.3 Alternative 3 - No Action

Continued discharge of CSOs into Lake Union would result in continued or increased levels of environmental health risk. There would be no reduction in frequency or volume of untreated CSO discharge; frequencies and volumes could increase accompanying additional development or redevelopment within the subbasin. Of particular concern to public health is the potential for ongoing or increasing discharge of pathogens, including bacteria and viruses, into south Lake Union. Health risks would be greatest during periods following rain events; individuals at risk include swimmers and waders or those who incidentally contact the water. Infrequent summer CSO events would pose the greatest potential risk, because water contact recreation is highest during this period. In addition to the potential for health risks associated with water contact, there is a risk associated with eating fish or shellfish from waters contaminated by CSO discharges. Under Alternative 3, this risk would continue unabated from current conditions, and may increase in the future as the area population increases, with accompanying potential increases in fishing.

6.7 NOISE

Emergency generators may be installed under Alternatives 1 and 2 at regulators and pump stations so flows can continue to move in the event of a power outage. The generators would be installed within a structure which would result in only a minor increase in noise levels in the immediate vicinity of the facility. Alternative 3 would not have any new facilities and would therefore not impact noise receptors.

6.8 LAND AND SHORELINE USE

No Alternative 1 or 2 facilities in the South Lake Union Subbasin would require a change in land use or designation. Since the area is currently built out, the additional aboveground facilities would not affect the percent of impervious surfaces. Operation of the facilities could create odors for adjacent land uses, but these odors could be removed with odor control devices (see Section 6.2). Operation of the CSO control facilities would not create noise or shoreline impacts for adjacent properties. Under Alternative 2, any new stormwater outfalls to Lake Union would need to be covered under the municipal stormwater NPDES permit (#WASM 23003) issued to the City of Seattle with King County as a co-permittee. Coverage would require implementation of appropriate source control and/or treatment BMPs as part of the project. Alternative 3 does not include any operating facilities. No significant adverse impacts would occur to land or shoreline uses from any of the alternatives.

6.9 RECREATION

Operation of the proposed Alternative 1 and 2 facilities would improve water quality in south Lake Union, significantly increasing recreational enjoyment of the lake. Alternative 2 would have less improvement as stormwater, with the potential for contaminants, would flow into Lake Union. Alternative 3 does not include any operating facilities.

6.10 AESTHETICS

Most proposed Alternatives 1 and 2 facilities in the south Lake Union area would be constructed entirely below ground and would not impact visual resources. Only a few control boxes would be located above ground and these would be relatively small (approximately 4x4x3 feet) and constructed of materials or architectural treatment to match their surroundings. Therefore, after construction, no aesthetic impacts would occur from operation of the proposed facilities in the South Lake Union Subbasin. No urban design elements would be impacted by operation of the proposed facilities.

6.11 HISTORICAL AND CULTURAL PRESERVATION

No impacts to historic properties or archaeological deposits in the project vicinity would be expected during operation of Alternative 1 or 2. No cultural resources would be affected by Alternative 3.

6.12 TRANSPORTATION

Under Alternatives 1 and 2, periodic maintenance activities at the pump stations, regulator stations, etc. which are constructed in street rights-of-way may temporarily disrupt traffic. Maintenance activities would generate approximately seven trips per month on several of the main arterials in the subbasin. Alternative 3 would not have any new facilities and would therefore not impact transportation resources. No significant adverse impacts would occur to land or shoreline uses from any of the alternatives.

6.13 PUBLIC UTILITIES AND SERVICES

No impacts to public utilities and services would occur from the operation of the facilities under either alternative.

6.14 SOCIOECONOMICS

Once facilities are completed, all road rights-of-way and public parks would be resurfaced or revegetated. There would be no adverse impacts to any minority or low-income populations or Tribal activities in the project area. Operational impacts would largely be associated with improvements in water quality resulting from the reduction in the frequency and volumes of CSOs in Lake Union. CSO discharges vary from event to event, but frequently contain high levels of bacteria, metals, and toxic organic constituents. Although public health officials advise against consumption of fish from Lake Union, some individuals with low incomes rely on such activities to supplement their diet. Individuals catching and consuming fish from Lake Union for subsistence would likely experience direct reductions in the risk of contamination due to the reduced loading of contaminants of concern. Muckleshoot Tribe fishing activities in Lake Union, part of the Tribe's usual and accustomed fishing area, would also benefit from improved water quality. Although human health risks (as defined by bacterial contamination) would not be eliminated, concentrations of contaminants of concern to human health are projected to decrease (refer to Section 6.3).

6.14.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

Operation impacts would be minimal under Alternative 1. Once construction was completed, all roads would be restored to pre-construction conditions. Operation would not interfere with any business activity. All surface access and excavation for facility components would take place in existing road rights-of-way and would not require acquisition of any properties. Depending on final alignment, routing of the Mercer Street Tunnel could require acquisition of sub-surface easements from various property owners. Specific parcels and costs would be determined once the final tunnel alignment was specified. No impacts related to population growth would occur. The project is designed to reduce CSO events in Lake Union through re-routing of current flows to the West Point Treatment Plant. No additional sewer capacity that would serve population beyond what is planned for by the City of Seattle would be provided by the project.

6.14.2 Alternative 2 - Partial Separation and Storage

Impacts would be similar to Alternative 1.

6.14.3 Alternative 3 - No Action

No facilities would be constructed under this alternative. As a result, there would be no disruptions to business activity.